

**TENNESSEE DEPARTMENT OF ENVIRONMENT
AND CONSERVATION**

DIVISION OF UNDERGROUND STORAGE TANKS



**CORRECTIVE ACTION PLAN
GUIDELINES**

JULY 2004

Instructions:

These guidelines are intended to provide a structured outline. Any information that is not specifically requested but is relevant to the project shall also be included. The following acronyms are frequently used in the Corrective Action Plan Guidelines:

CAC	Corrective Action Contractor
CAP	Corrective Action Plan
CAS	Corrective Action System
CASDR	Corrective Action System Down Report
CASFL	Corrective Action System Field Log
CASRL	Corrective Action System Repair Log
CAT	Corrective Action Technology
COC	Chemical of Concern
EA	Exposure Assessment
EAC	Environmental Assistance Center
EAG	Environmental Assessment Guidelines
MSL	Mean Sea Level
MNA	Monitored Natural Attenuation
O&M	Operation and Maintenance
OVD	Organic Vapor Detector
PAR	Person Assuming Responsibility
PID	Photoionization Detector
PPM	Parts Per Million
PM	Performance Measures
RBSL	Risk Based Screening Level
SSTL	Site Specific Target Level
SVE	Soil Vapor Extraction
TGD	Technical Guidance Document

Any confirmed release of petroleum or petroleum product that results in concentrations of a Chemical of Concern (COC) above the applicable Risk-Based Screening Level (RBSL) or the applicable Site-Specific Target Level (SSTL) requires corrective action. An Exposure Assessment (EA) shall be conducted prior to the submittal of a Corrective Action Plan (CAP) to determine the applicable RBSL or the applicable SSTL for each COC. If soil or ground water contamination is above the applicable RBSLs or SSTLs, then complete the relevant portions of the CAP.

All geologic work specified in this document shall be directed by a registered professional geologist under the Tennessee Geologist Act (T.C.A. §62-36-101 et seq.), or a registered professional engineer under the Tennessee Architects, Engineers, Landscape Architects, and Interior Designers Law and Rules (T.C.A. §62-2-101 et seq.). A registered professional engineer shall oversee all corrective action design specifications. This plan shall describe in detail the specifications of the corrective action chosen along with a detailed, itemized cost proposal of the chosen technology. Proposed corrective actions shall remediate and prevent further migration of the contaminant plume(s).

If the CAP will not be submitted by the established deadline, then a written request, justifying the extension shall be submitted before the deadline to the appropriate Environmental Assistance Center (EAC). An extension is not automatic and enforcement actions may be taken to insure prompt compliance with established deadlines.

The prepared CAP shall be submitted as a stand-alone document consisting of Part A and Part B. Part A shall be submitted in whole (using the provided template) and includes the general requirements for the CAP. Part A enforces the minimum requirements set forth by the Division and shall not be modified.

Part B shall be prepared and submitted in accordance with the guidelines set forth in this document and includes the site-specific proposal for the CAP. Each section of Part B shall be prepared and assembled in the order presented within these guidelines and each page, including all appendices, shall be numbered. Text shall be provided explaining the associated tables, figures and maps. All tables, figures and maps shall be in the appropriate sections, not in appendices. All maps shall be drawn on 8.5 x 11 or 11 x 17 inch paper and contain at a minimum, the UST Facility Identification Number, the date the map was drawn, a north arrow, a legend, a scale bar, a vertical scale, if applicable, and a figure number. The preparer shall assemble the information in each section to provide a comprehensive final document. Each section and subsection heading shall be clearly printed in the report. A table of contents shall be provided listing the location of all sections, maps, tables, figures and appendices.

The signature page becomes an agreement to satisfy the requirements set forth in the CAP, when signed by the Person Assuming Responsibility (PAR) for implementation of the CAP **and** by the Corrective Action Contractor (CAC) contracted to implement the CAP.

All correspondence, reports, laboratory analysis sheets, etc. shall contain the UST Facility Identification Number. All original correspondence and reports shall be submitted to the appropriate UST EAC and copied to the central office.

CORRECTIVE ACTION PLAN GUIDELINES

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CORRECTIVE ACTION PLAN

UST Facility Identification Number:

UST Facility Name¹:

Current or Last Business Name² of Location:

Name of the tank owner and/or operator at the time of the release:

Name of the company and/or individual submitting this CAP:

Name of the PAR³ for implementation of this CAP:

Name of the CAC who prepared this CAP:

Name of the individual(s) who prepared this CAP including applicable license or registration and number:

¹ If this facility is no longer an active UST facility, enter the name of the last known UST facility operated at this site.

² Enter information here only if there is no longer an active UST facility at this site or if the name displayed on the building or signage is different from the facility name.

³ This is the individual, such as the tank owner, the tank operator, the property owner, or a specific representative of the business which is the tank owner, tank operator or the property owner and who is authorized to act on behalf of that business.

PART A-GENERAL REQUIREMENTS OF THIS CAP

I. Purpose of this CAP

This CAP has been submitted as required by rule 1200-1-15-.06(7)(a) and shall be implemented as modified and approved by the Division of Underground Storage Tanks (division). Non-compliance with this CAP shall be considered as non-compliance with rule 1200-1-15-.06(7). The ultimate purpose of this CAP is to accomplish the goal of adequate protection of human health, safety and the environment.

II. Structure of this CAP

The outline structure for this CAP shall be as follows:

I. Section

A. Subsection

1. Paragraph

a. Subparagraph

i. Item

(a) Sub-item

III. Professional Registrations

- A.** Professional geological work, as defined in T.C.A. §62-36-101(5), conducted during the implementation of this plan shall be performed by a Registered Professional Geologist or a Registered Professional Engineer performing work within that engineer's area of competency.
- B.** Oversight of design work shall be by a Registered Professional Engineer in accordance with the provisions of T.C.A. §62-2-101 et seq. and T.C.A. §62-2-401 et seq.
- C.** The signature and the Tennessee Registration Number of the Registered Professional Geologist and/or Registered Professional Engineer shall be placed on the signature page of each report required by this plan. Each such signature shall be properly notarized.

IV. Notification of Field Activities

Advance notice shall be given to the appropriate UST EAC during normal office hours at a minimum of twenty-four (24) hours prior to starting any planned field activity. If emergency unplanned field activities take place, then the appropriate UST EAC shall be notified no later than 4:00 pm⁴ on the next regular business day (Monday through Friday, excluding state observed holidays).

V. General Requirements for Corrective Action Systems (CAS) and Corrective Action Technologies (CAT)

The installation and/or operation of CAS and/or CAT or the components thereof shall not result in, nor contribute to, the spread of contamination nor increase the risk to human health, safety and/or the environment.

A. CAS Tasks and Record Keeping Requirements

1. A “Corrective Action System Field Log” (CASFL) shall be completed during each site visit. This log shall be prepared in accordance with the CASFL in the current CAP Guidelines located in Appendix A. 1 and submitted with the appropriate monitoring report in an appendix, unless directed to do otherwise by the Division. Any additional information unique to a system may be attached.
2. CAS start-up activities shall, at a maximum, include daily activities during the first week of CAS operation and then weekly activities (once per week) for the first three (3) months of CAS operation. Documentation of these activities shall be prepared in accordance with the CASFL in the current CAP Guidelines located in Appendix A. 1 and submitted with the appropriate monitoring report in an appendix.
3. After CAS start-up, routine CAS activities shall, at a maximum, be performed monthly. If during the first three months monitoring period, additional site visits are justified, then a proposal including costs shall be submitted for prior approval. Routine CAS activities may include but not be limited to changing filters, hoses, compressor oil, lubricants, and belts, repair/replacement of gauges, pressure steam cleaning the stripper, backwashing the system to remove fouling and iron buildup, inspecting for leaks, excessive equipment heat and noise and equipment wear. Documentation of these activities shall be prepared and submitted in accordance with the CASFL in the current CAP Guidelines located in Appendix A. 1 and submitted with the appropriate monitoring report in an appendix.
4. After CAS start-up, non-routine CAS activities shall be performed in response to a system shutdown or failure. A “Corrective Action

⁴ This shall be 4:00 pm in the time zone in which the EAC having oversight of this corrective action is located.

System Repair Log” (CASRL) shall be completed during each site visit. This log shall be prepared in accordance with the CASRL in the current CAP Guidelines located in Appendix A. 2 and submitted with the appropriate monitoring report in an appendix.

5. After CAS start-up, continuous telemetry monitoring shall be used to monitor system operation.
6. All measurements and samples shall be collected while the CAS is in operation unless otherwise approved by the Division.
7. The flow direction and fluid (i.e. air, product or water and indicate by color) for all CAS piping and pressure rating for all vessels shall be labeled according to current ASTM standards.

B. Conditions that Warrant a Seventy-two (72) hour Notification

The local UST EAC case manager shall be notified within seventy - two (72) hours if one or more of the following occurs:

1. An impact occurs or reoccurs to any receptor;
2. Changes in land, surface, and/or ground water use are discovered that would require a re-evaluation of the Exposure Assessment (EA) upon which the applicable Risk Based Screening Levels (RBSLs) or the applicable Site Specific Target Levels (SSTLs) are based;
3. Free product is discovered and has not been previously identified during any other assessment activity; and/or
4. Free product thickness increases above historic levels in any monitoring well.

C. CAS Evaluation

If an active system is being used to remediate the site, then the effectiveness of the CAS shall be evaluated in accordance with the plan in Part B, Section V, Subsection H of the approved CAP. The following items shall be addressed in the appropriate monitoring reports and shall be submitted in accordance with the Schedule located in Appendix A. 3:

1. A discussion of the evaluation and Performance Measures (PMs) established in the approved CAP;
2. System runtime (%);
3. System operation versus manufacturer’s specifications;

4. Contaminant removal efficiency (%);
 - a. Free product recovery [current thickness versus thickness at the time of installation (%) and product distribution if applicable];
 - b. Ground water concentration reduction [historical concentration, versus time (ppm/year) and current concentration versus concentration at the time of installation (% reduction, if applicable)];
 - c. Soil concentration reduction [historical concentration versus time (ppm/year) and current concentration versus concentration at the time of installation (% reduction)]; if applicable, and
 - d. Plume reduction, including stability and movement.
5. Equipment expendables (i.e., filters, belts, oil, etc.) versus time; and
6. Corrective Action Technology (CAT) specific indicators of performance, including but not limited to, pH fluctuation, oxygen depletion, biological and/or geochemical parameters indicative of a need for modification of the CAT.

D. Performance Measures (PM) of Site Remediation

An evaluation of the CAT shall be conducted by the PAR upon receipt of new field and analytical data. The PMs approved in Section VII of Part B of the approved CAP shall be the basis upon which to evaluate the effectiveness of the CAT. If the PMs indicate that the CAT is not accomplishing its goals, then the division shall be notified within thirty (30) days of the PM evaluation in the appropriate monitoring report and consideration shall be given to the possible need for modification of this CAP.

PMs shall include, but not be limited to, the following:

1. The estimate of reasonably expected down time for the CAS made and expressed as either a percentage of total operating time or a frequency of occurrences or both in Part B of the approved plan shall be compared to the actual performance (operating time and down time) of the system.
2. If free product is known to exist at the site at the time of CAP approval or modification and free product removal is one of the remediation goals of this CAP, then both the long and short term objectives of free product recovery at this site stated in Part B of the approved CAP, shall be compared to actual site conditions at least annually. PMs related to these objectives which are included in Part B of this CAP

shall be compared to the actual free product monitoring data after each free product monitoring event.

3. An annual evaluation of the trends (i.e. a comparison of the current ground water monitoring results to those predicted trends for reaching the applicable RBSLs or SSTLs in Part B of the approved CAP).

E. Evaluation of Performance Meeting

An Evaluation of Performance Meeting may be held between the PAR, CAC, and division personnel, as deemed necessary by the division. Topics for discussion shall include but not be limited to the following:

1. COC concentration reduction (i.e., have applicable RBSLs or SSTLs been achieved);
2. Plume dynamics (spreading, shrinking or stability of aqueous, non-aqueous and adsorbed phases);
3. System operational performance;
4. System repair history; and
5. Recommendations for system and/or CAP modifications to increase system performance.

F. CAS Repairs and/or Maintenance

Repairs to and/or maintenance of the CAS shall be performed in a manner that does not result in, nor contribute to, the spread of contamination nor increase the risk to human health, safety and/or the environment.

1. Corrective Action System Down Report (CASDR)

The appropriate UST EAC shall be notified by submitting a CASDR within three (3) business days of any system downtime that exceeds seventy-two (72) hours in length (continuous downtime). If the cost for the repair will exceed \$2,000.00, then a cost proposal for the repair, itemizing personnel time, installation costs, and capital equipment costs, shall be submitted with the CASDR. A schedule for when the system will be operational shall also be included. A cost proposal for any repairs exceeding \$2,000.00 must be approved by the division prior to making the repair. The CASDR shall be prepared and submitted in accordance with the CASDR in the current CAP Guidelines located in Appendix A. 4. The appropriate UST EAC shall be notified within five (5) calendar days of returning the CAS to operation.

2. CAS Repair Monitoring

CAS repair monitoring shall consist of collecting CAS repair data during each repair visit. A CASRL shall be completed during each site visit related to CAS repair. The log shall be prepared and submitted in accordance with the CASRL in the current CAP Guidelines located in Appendix A. 2 and submitted with the appropriate monitoring report.

G. Permit Sampling Requirements

The frequency and sampling requirements for discharge (air and/or water) permits shall be performed according to the approved federal, state, and/or local government agency requirements.

VI. Monitoring Events

A. Types of Monitoring Events

Each monitoring event scheduled in Appendix A. 3 of this CAP shall be one of the following:

1. Comprehensive Monitoring Event – that shall consist of sampling all monitoring and recovery wells in addition to performing any other tasks as designated on the Schedule located in Appendix A. 3 of this CAP.
2. Site Status Monitoring Event – that shall consist of sampling of all approved monitoring and recovery wells as specified in Part B of this CAP in addition to performing any other tasks as designated on the Schedule located in Appendix A. 3 of this CAP.
3. Closure Monitoring Event - that shall consist of sampling all approved monitoring and recovery wells as specified in Part B of this CAP in addition to performing any other tasks as designated on the Schedule located in Appendix A. 3 of this CAP.

B. Monitoring Schedule

Monitoring shall be conducted in accordance with the Schedule(s) set forth in Appendix A. 3 of this CAP. The Schedule in Appendix A. 3 shall include all monitoring events and tasks that are required by this CAP. If during the first three months monitoring period, additional site visits are justified, then a proposal including costs shall be submitted for prior approval.

C. Monitoring Tasks

If Part B of this CAP includes one or more of the following monitoring tasks, then the task(s) shall, at a minimum, consist of the components listed below:

1. Water Monitoring Task – This task shall consist of:
 - a. Obtaining water level measurements from all monitoring and recovery wells;
 - b. Obtaining free product measurements from all monitoring and recovery wells, if applicable;
 - c. Obtaining free product level measurements from any release detection wells and/or observation wells, if applicable;
 - d. Sampling all approved monitoring wells and recovery wells in accordance with the current Environmental Assessment Guidelines (EAG) for the appropriate COCs; and
 - e. Sampling all surface water and drinking water supplies for the appropriate COCs as required by this CAP. Discovery of a previously unknown surface water or drinking water supply shall be evaluated as a possible cause for CAP modification or termination (see Section VIII of Part A.)
2. Free Product Removal Monitoring Task – This task shall consist of obtaining and documenting free product level measurements during each routine O&M site visit, if any well has a history of free product. This task also includes the removal of free product, by hand bailing, when encountered in a well during monitoring. The bailed free product shall be introduced into the product compartment of the oil/water separator of the CAS for treatment.
3. Soil Monitoring Task – This task shall consist of the installation of one boring in the location(s)⁵ where the highest level(s) of soil contamination was (were) known to exist through previous site assessment activities. The soil sample(s) shall be collected every two (2) years from the implementation of this CAP. The sample(s) shall be collected and analyzed in accordance with the current EAG for the appropriate COCs.
4. Vapor Monitoring Task – This task shall consist of monitoring of all subsurface structures (i.e., basements, utility vaults, sewers, etc.) for petroleum vapors within three hundred (300) feet of known contamination. Known contamination shall be defined as all sampling locations where analytical results document contamination above the applicable RBSLs or SSTLs or where free product has been observed.

⁵ More than one location shall be sampled at sites with more than one soil plume area.

All structures that have been previously impacted by petroleum vapors shall also be monitored.

5. Monitored Natural Attenuation Task – This task shall consist of the collection of geochemical and/or biological samples and evaluation of parameters that support intrinsic remediation such as dissolved oxygen, nitrate, sulfate, total dissolved iron, methane, and total organic carbon. Sampling and laboratory analysis for the appropriate COCs shall also be a part of this task.
6. Land and Water Use and Receptor Monitoring Task– This task shall consist of monitoring for changes in land, surface, and/or ground water use surrounding the site. The discovery, addition or removal of receptors may change the basis upon which the applicable RBSLs or SSTLs were developed. If a change that would affect the applicable RBSLs or SSTLs is noted, then the PAR will immediately notify the division and a meeting may be necessary. If such a meeting is necessary, then the PAR shall attend the meeting. Notification of the meeting shall be in writing from the division.

D. Environmental Samples

Environmental samples shall be collected, handled, stored and transported in accordance with any prerequisites for the laboratory method(s) to be applied to the sample. Sampling tasks shall also be performed in accordance with the current EAG.

E. Laboratory Test Methods

Environmental samples shall be tested using laboratory methods acceptable to the division at the time of sample collection.

VII. Monitoring Report Requirements

A monitoring report shall be prepared within thirty (30) days of completion of each monitoring event identified in Section VI. A. of this Part of this CAP. The report shall be one of the following three (3) types of monitoring reports: Comprehensive Monitoring Report, Site Status Monitoring Report, or Closure Monitoring Report. The monitoring report(s) shall be submitted in a format established by and in accordance with instructions provided by the division.

The monitoring report shall cover site activities since the previous monitoring report and shall include the following information, at a minimum:

A. Facility Information

The UST Facility Identification Number, name, and address of the facility;

B. Monitoring Period

The time period covered by the report; and

C. Monitoring Progress, Problems, and Results

The most current information supplied in accordance with the requirements set forth below:

1. Progress

- a. An "as built" equipment diagram shall be supplied for each CAT. The "as built" diagram shall include at a minimum: a process and flow diagram, a site map including the recovery well(s), trench(s), monitoring well or extraction points, and system compound layout. These diagrams shall be submitted **only** in the first monitoring report after the CAS has been installed or in any subsequent reports after a major modification has been made to the CAS⁶. All boring logs for recovery wells or extraction points shall be completed in accordance with TGD-006, "Standard Drilling Log" and also included with the first monitoring report.
- b. The "Remediation Equipment Installed Table" located in Appendix A. 5 shall be provided documenting the actual remediation equipment installed (i.e., manufacturer, model number, operating parameters, etc.). This table shall be submitted only in the first monitoring report after the CAS has been installed or in subsequent reports after a major modification has been made to the CAS.
- c. If any corrective action has taken place since the last report, then the report shall describe the progress of the CAS to date. Information in the report shall include but not be limited to the following:
 - i. The "Operation and Maintenance Monitoring Table" located in Appendix A. 6 including the results of all sampling events based upon the readings taken during all visits to the site. The table shall include at a minimum:
 - (a) Average flow rate for ground water for the reporting period;

⁶ If diagrams are provided in other types of reports, i.e., reports subsequent to the initial report that do not follow a major modification, then the cost of those diagrams will not be considered to be a reasonable cost and will not be reimbursed from the fund.

- (b) Average flow rate for air for the reporting period;
- (c) The total gallons of water treated for the reporting period;
- (d) The cumulative total gallons pumped to date;
- (e) The days of downtime for the reporting period;
- (f) The total days in the reporting period;
- (g) The percent (%) time the system was down during the reporting period;
- (h) If applicable, the gallons of free product removed during the reporting period;
- (i) If applicable, the cumulative gallons of free product removed to date;
- (j) The pounds of hydrocarbon removed during the reporting period; and
- (k) The cumulative pounds of hydrocarbon removed to date.

Provide in an appendix the “Corrective Action System Field Log” (CASFL) of all CAS readings taken during any site visit unless directed to do otherwise by the Division.

- ii. If applicable, the “Air Emissions Monitoring Table” located in Appendix A. 7. shall be provided including the results from all monitoring events of all air emissions of the soil and/or ground water from the CAS. This table shall be based upon the readings taken during all site visits. The results obtained from the monitoring of air emissions from the CAS shall be described in the report.
- iii. If applicable, the “Free Product Removed Table” located in Appendix A. 8. shall be provided including the gallons of free product removed during the reporting period and the cumulative gallons removed to date. The table shall include only those wells that historically or currently have free product. The report shall describe the method for management and disposal of the free product.
- iv. The “Operation and Maintenance Cost Table” located in Appendix A. 9 shall be provided including all monthly costs incurred at the site and the total costs incurred to date associated with monitoring and O & M after installation of the CAS. Costs shall include at a minimum:

- (a) The number of site visits per month;
 - (b) All personnel time on site;
 - (c) All personnel time off site;
 - (d) Report preparation;
 - (e) Analytical costs;
 - (f) Equipment rental;
 - (g) Supplies;
 - (h) Capital equipment;
 - (i) Repairs;
 - (j) Utilities;
 - (k) Fees;
 - (l) Per diem;
 - (m) Mileage;
 - (n) Total monthly costs; and
 - (o) Cumulative costs to date.
- v. The following site status and inspection information for each site visit, at a minimum, shall be provided in the “System Status and Inspection Table” located in Appendix A. 10:
 - (a) The date of the visit;
 - (b) Total time on site;
 - (c) Names of all personnel and title who were on the site;
 - (d) Detailed purpose of the visit;
 - (e) All inspections, repairs and/or cleaning activities performed;
 - (f) Operational status of the CAS upon arrival; and
 - (g) Operational status of the CAS upon departure.

An appendix shall contain the CASFLs and the CASRLs for all site visits, unless directed to do otherwise by the Division.
- vi. All telemetry data gathered during the reporting period shall be provided as a computer printout and attached in an appendix in the appropriate monitoring report. The report shall include an alarm history printout and an alarm code key.

2. Problems

Any problem(s) that has(have) been encountered since the previous report and the actions taken to resolve the problem(s) shall be described in the report. A description of any delay(s) in returning the CAS to operation during the site visit shall be provided. If the CAS has been non-operational or down for extended periods of time greater

than seventy-two (72) hours, then detailed documentation and explanation for the delay shall be provided. The “Operation and Maintenance Monitoring Table” located in Appendix A. 6, shall contain a report of the percent of time the CAS was out of operation during the reporting period.

If the CAS is operating for eighty-five percent (85%) or less of the reporting period as documented on the CASDR, then detailed documentation of the reason for the downtime and efforts to reactivate the CAS shall be submitted. An appendix shall contain the CASDR for each seventy-two (72) hour documented occurrence. An Evaluation of Performance Meeting may also be scheduled by the division to discuss the downtime and any CAS modifications that may be necessary. If such a meeting is necessary, then the PAR shall attend the meeting. Notification of the meeting shall be in writing from the division.

3. Results

a. Soil Analytical Data

- i. The report shall describe the results of any soil sampling conducted during the reporting period. If no soil contamination exists above the applicable RBSLs or SSTLs, then the report shall state that this section is not applicable. If no soil sampling was required for this sampling period, then provide the date of the next scheduled soil sampling event. A summary of any new soil investigation activities shall be included with the report. This summary shall be prepared in accordance with current guidelines and shall include but not be limited to, a detailed boring log for each new boring that is prepared in accordance with TGD-006. All analytical results from **all** sampling events shall be included in the “Soil Analytical Results Table” located in Appendix A. 11, (for all appropriate COCs as required by this CAP as approved by the division) along with the following information:

- (a) Boring number or location of additional sampling points;
- (b) Sample depth;
- (c) Date sample was collected;
- (d) Parameter (i.e., the appropriate COCs);
- (e) Photoionization Detector (PID) or Organic Vapor Detector (OVD) readings;
- (f) Analytical Result (Parts Per Million, PPM); and
- (g) Applicable RBSLs or SSTLs.

ii. All original laboratory analysis and chain of custody sheets for this monitoring period shall be provided in an appendix. All laboratory analysis sheets shall include the following:

- (a) The UST Facility Identification Number;
- (b) Boring number or location of additional sampling points;
- (c) Date sample was collected;
- (d) Date sample was analyzed;
- (e) Parameter analyzed (i.e., the appropriate COCs);
- (f) Analytical method;
- (g) The detection limit;
- (h) Dilution factor;
- (i) Unit of measurement (Parts Per Million, PPM); and
- (j) Authorized laboratory signature.

b. Potentiometric Data

i. The report shall provide water level data in the “Potentiometric Data Table” located in Appendix A. 12, for all sampling events containing the following information:

- (a) Monitoring well number or additional sampling point;
- (b) Date measured;
- (c) Top of casing elevation relative to MSL;
- (d) Top of screen elevation to MSL;
- (e) Total depth of well;
- (f) Bottom of screen elevation to MSL;
- (g) Depth from top of casing to free product;
- (h) Depth from top of casing to water;
- (i) Thickness of free product (in feet);
- (j) Potentiometric surface elevation relative to MSL;
- (k) Adjusted potentiometric surface elevation relative to MSL; and
- (l) Top of screen submerged (yes or no).

All ground water measurements previously recorded shall be represented in this table.

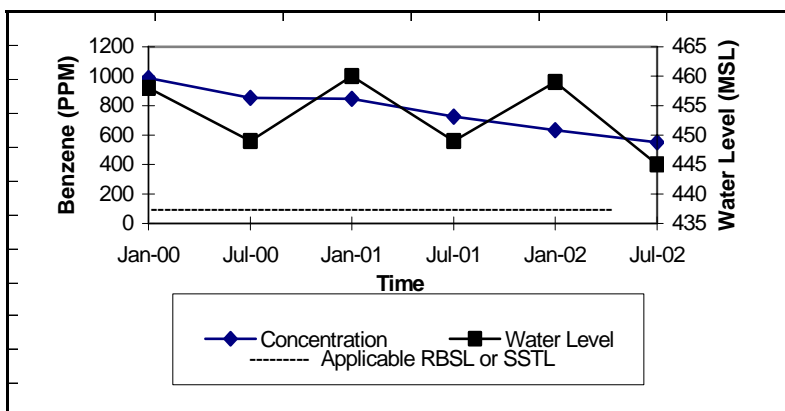
ii. Two (2) scaled potentiometric maps derived from data collected at least thirty (30) days apart, from the data

collected during the last two (2) monitoring periods, shall be provided. If multiple aquifers were investigated due to the presence of contamination in a deeper aquifer and sufficient data is generated, then potentiometric maps shall be included for each aquifer. Each map shall also include an arrow depicting the interpreted direction(s) of ground water flow.

c. Water Analytical Data

- i. The report shall provide the “Water Analytical Results Table” located in Appendix A. 13, (for all appropriate COCs as required by this CAP as approved by the division) prepared in accordance with the following list using laboratory analytical results from **all** events. The table shall provide all ground water, drinking water supply, and surface water analytical results. This table shall include the following information:
 - (a) Monitoring well number or location of additional sampling points;
 - (b) Date sample was collected;
 - (c) Parameter (i.e., the appropriate COCs);
 - (d) Unit of measurement (Parts Per Million, PPM); and
 - (e) Applicable RBSLs or SSTLs.
- ii. All original laboratory analysis and chain of custody sheets for this monitoring period shall be provided in an appendix. All laboratory analysis sheets shall include the following:
 - (a) The UST Facility Identification Number;
 - (b) Monitoring well number or location of additional sampling points;
 - (c) Date sample was collected;
 - (d) Date sample was analyzed;
 - (e) Parameter analyzed (i.e., the appropriate COCs);
 - (f) Analytical method;
 - (g) The detection limit;
 - (h) Dilution factor;
 - (i) Unit of measurement (Parts Per Million, PPM); and
 - (j) Authorized laboratory signature.
- iii. Graphs for each well sampled showing the ground water contaminant concentrations for all appropriate COCs detected above the applicable RBSLs or SSTLs

and ground water levels versus time shall be provided. A dashed line shall indicate the applicable cleanup level for RBSLs or SSTLs. Only one COC shall be shown on any one graph. All ground water data shall be used and the point in time when the CAS became operational shall be indicated. Graphs shall indicate the required information as shown in the example below:



- iv. A graph shall be provided for each monitoring event showing the influent and effluent contaminant concentrations for all appropriate COCs for sites in ground water corrective action.
- v. If Comprehensive Monitoring is conducted, then a separate scaled plan view map shall be provided for each COC, showing the horizontal extent of COC contamination. All contaminant plumes shall be defined to the applicable RBSL or SSTL for the appropriate COCs. The map shall include the location of tanks, product and vent lines, dispensers, underground utilities, soil borings and monitoring wells (properly labeled and including COC concentrations in ground water), etc. Former tank pits and/or system components shall be indicated with a dashed line. The horizontal extent of any free phase product shall be depicted using the pure product saturation as provided in TGD-008, "Exposure Assessment" for any well with free product that was not sampled.

d. Vapor Monitoring Results

The report shall describe the results of the vapor monitoring. A map showing the locations of the monitoring points and the table "Vapor Monitoring Results", located in Appendix A. 14,

indicating all results of the vapor monitoring shall be provided in the appropriate section of the report text.

e. Emissions Monitoring Results

The report shall describe the results of all sampling events obtained from the monitoring of any SVE systems and/or ground water treatment systems on the table “Air Emissions Monitoring”, located in Appendix A. 7. The table shall determine the cumulative contaminant mass removed using the formula,

$$M = C \times Q \times t$$

Where: M = cumulative mass removed (kg)
 C = vapor concentration (kg/m³)
 Q = discharge flow rate (m³ / min.)
 t = operational period (minutes)

A single graph of contaminant mass removal versus operation time and of discharge concentration versus operation time shall be provided.

f. Corrective Action System Results

The report shall describe the results of the effectiveness of the CAS. The report shall include, at a minimum:

- i. A discussion of the evaluations and goals established in the proposed CAP;
- ii. System runtime (% uptime);
- iii. System operation versus manufacturers’ specifications;
- iv. Venting system efficiency (%), if applicable;
- v. Vacuum system efficiency (%), if applicable;
- vi. Air stripper efficiency (%), if applicable;
- vii. Contaminant removal efficiency (%);
 - (a) Free product recovery [current thickness versus thickness at the time of installation (%)], if applicable;
 - (b) Ground water concentration reduction [historical concentration versus time (ppm/year) and current concentration versus concentration at the time of installation (% reduction)], if applicable;
 - (c) Soil concentration reduction [historical concentration versus time (ppm/year) and current concentration versus concentration at the time of installation (% reduction)], if applicable, and

viii. Equipment expendables (i.e. filters, belts, oil, etc.) versus time.

g. Monitored Natural Attenuation Results

The report shall identify any new releases detected and/or any changes in the environment that might reduce the effectiveness of the natural attenuation process, such as changes in the geochemical or biological conditions. The report shall describe the results of any sampling conducted during the monitoring period. Any changes (reductions or increases) in the COC concentrations shall be documented and compared to the changes predicted in Section VII of Part B. A discussion of the data analysis method(s) used to determine if the results are consistent with the predictions shall be included.

h. Additional Information

Provide any additional information that was included in the approved CAP or required by the division. If applicable, then provide this additional information in tables or maps.

VIII. Modification or Termination of this CAP

The PAR shall, in accordance with a schedule included in a request letter from the division, furnish any relevant information necessary to determine whether cause exists for modifying or terminating this plan. The PAR shall also attend an evaluation of corrective action performance meeting if scheduled by the division to evaluate the feasibility of CAP modification, termination or other related issues.

A. Modification of this CAP

Causes for modification of this CAP as approved may include, but not be limited to:

1. A determination by the PAR or the division, upon completing an evaluation of the ground water monitoring results collected for the first two (2) years following the startup of the approved CAS, that there has been no reduction in the levels of contamination and/or free product at the site based on remedial system effectiveness;
2. Subsequent to the evaluation in the previous item (VIII. A.1) of this section, if a trend of reduction in contamination levels, plume size and/or free product levels is not observable on an annual basis by the PAR or the division;

3. If cause exists to modify this CAP as approved, and the division notifies the PAR in writing that the approved CAP is to be modified, then the PAR shall submit a modified CAP for approval, in accordance with a schedule and in a format specified by the division;
4. If the PAR determines that cause exists to modify this CAP as approved, then the PAR shall petition the division stating the reasons why the approved CAP should be modified. Upon receipt of written notification from the division that cause exists to modify the approved CAP, the PAR shall then submit a modified CAP for approval, in accordance with a schedule and in a format specified by the division;
5. If the division determines that cause exists, in accordance with item VIII. A. 3. of this section, to modify the approved CAP, then the division may require the submittal of a revised site-specific standard request. If the PAR is notified of such by the division, then a revised site-specific standard request shall be submitted in accordance with a format established by and in accordance with instructions provided by the division; or
6. Excessive down time has been documented and/or reported for the CAS.

Unless instructed to do otherwise in writing by the division, this CAP as approved shall remain in effect until replaced by an approved modified CAP or until the existing CAP is terminated.

B. Termination of this CAP

Reasons that may be considered for termination of this CAP as approved may include:

1. Whenever **all** of the following criteria have been met:
 - a. There has been no free product at the site for two (2) years;
 - b. No vapors have been detected in subsurface structures for at least two (2) years;
 - c. Each of the last three (3) sampling events has shown a decline in contamination at the site;
 - d. Levels of COCs are below the applicable RBSLs or SSTLs for the site; and
 - e. If the contaminated ground water at the site was determined to meet the definition of a drinking water supply before the

contamination occurred and no drinking water well has been impacted by contamination for the past two (2) years.

2. The regulations in effect at the time that this CAP was approved have been amended and such amendments require modification or termination of this CAP;
3. The approved CAP is not achieving the cleanup levels (applicable RBSLs or SSTLs) contained in the approved CAP;
4. Risk to human health, safety and/or the environment may have increased to such an extent that a new EA may be required by the division under the provisions of subsection A of this section. (New applicable RBSLs or SSTLs may need to be established and required in a modified CAP based on the new exposure assessment. This might be the result of the discovery of new receptors or the elimination of existing receptors.)
5. Excessive down time has been documented and/or reported for the CAS;
6. The actual costs will exceed the cost proposal included in Part B of this CAP; or
7. The corrective actions have accomplished the goal of adequate protection of human health, safety and the environment at the site and there is no longer a need for corrective action, carried out under the approved CAP.

IX. Signature Page

Provide a signature page as attached.

PART B-SITE-SPECIFIC PROPOSAL

I. Executive Summary

Provide an Executive Summary describing the progress of the project to date. Identify the source, type, and amount of petroleum released and the date the release was discovered. Include a brief discussion of all initial abatement activities performed to date. Identify all impacts resulting from the release. Discuss the conclusions and interpretations of data derived from the environmental assessment and exposure assessment activities.

II. Applicable RBSLs or SSTLs

Provide a table “Applicable Cleanup Levels for Chemicals of Concern”, Appendix A. 15, (both for soil and ground water) that includes the following:

- A. The applicable RBSLs or the applicable SSTLs for each COC [in parts per million (ppm)] in soil or ground water as determined in the EA ;
- B. The soil or ground water concentrations for each COC identified during the last comprehensive monitoring event; and
- C. Identify which COCs have exceeded the applicable RBSLs or SSTLs by shading the appropriate box.

III. Proposed Corrective Action Technology

A. Soil

If soil contamination above the applicable RBSLs or the applicable SSTLs exists on site, then state the proposed CAT that will most expeditiously and cost effectively result in a risk-based approved closure.

The proposed CAT of choice shall be or include overexcavation. If overexcavation is not feasible at this site, then provide a justification for the proposed alternative soil treatment method. The following outline shall be used in evaluating the applicability of this proposed CAT to the site.

1. Excavation

- a. **Excavation shall be the preferred method for soil remediation,** unless the integrity of a structure would be compromised or other physical limitations will not allow excavation. Provide a detailed description of the excavation plan which includes the following:
 - i. Estimated volume of soil to be excavated;
 - ii. Method of excavation of soil;
 - iii. Removal of piping, dispensers, canopy, etc.;

- iv. Disposal and/or treatment methods and costs (if applicable) for all excavated material that will be screened and sampled in accordance with the current TGD – 005 and/or TGD - 009;
 - v. Facility down time (loss of business);
 - vi. Implementation schedule; and
 - vii. Any other pertinent information.
- b. Provide a scaled plan view map depicting the layout of the proposed excavation zone to the applicable RBSLs or SSTLs. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and proposed excavation depth(s). Indicate former tank systems with a dashed line. This map shall also include Line A-A' which shall be perpendicular to the direction of ground water flow and Line B-B' which shall be perpendicular to the direction of ground water flow. These lines shall intersect as many wells as possible and shall represent the widest areas of the soil and ground water contaminant plumes. These lines shall be used for all subsequent cross section maps.
 - c. Provide a scaled cross section map representing Line A-A' and Line B-B' respectively and showing the extent of the excavation zone overlaid on a depiction of the horizontal and vertical extent of the contaminant plume(s) for each of the applicable RBSLs or SSTLs.
 - d. Provide a sampling plan describing the field screening and sampling that will be conducted in accordance with the current EAG to verify the in-situ concentrations of the COCs after excavation (Division approval of additional soil removal beyond the approved CAP shall be required). The plan shall include the number and locations of the samples to be collected. Provide a scaled site map depicting the sampling points. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and proposed excavation depth(s). Indicate former tank systems with a dashed line.
 - e. If applicable, then provide a detailed description of any self-initiated soil cleanup measures not previously approved by the division.

2. Other Active Soil Remediation Methods

- a. If structural integrity would be compromised by excavation, or other physical limitations will not allow excavation, and/or another active method is proposed, then provide a description

of the proposed CAT. Specify why the proposed CAT is best suited for implementation at this site. Include as justification a discussion of costs and overall project life expectancy. Provide a detailed description including:

- i. Individual component specifications;
 - ii. Capital costs (Prepackaged systems should not be broken into individual components);
 - iii. Total system installation costs;
 - iv. Removal of piping, dispensers, canopy, etc.;
 - v. Site surface coverage (i.e. grass, gravel, concrete, asphalt, etc.);
 - vi. Disposal and/or treatment methods and costs (if applicable) for all excavated material that will be screened and sampled in accordance with the current TGD – 005 and/or TGD - 009;
 - vii. Other items such as enclosures, permit fees, etc.;
 - viii. Winterization;
 - ix. Facility down time (loss of business);
 - x. Implementation schedule; and
 - xi. Any other pertinent information.
- b. If applicable, then provide a process flow diagram including all components of the proposed CAS. Provide all equipment brochures and manufacturers' design specifications in Appendix B.
- c. If applicable, then provide the calculated effective radius of influence (show calculations). If a Soil Vapor Extraction (SVE) system is proposed, then a minimum vacuum of one (1) inch of water shall be used to define the effective radius of influence. If a SVE system is proposed, then provide the rationale for the design and placement of the vapor extraction wells and the vacuum pump design. Vacuum extraction wells shall be installed such that the screen is always above the water table and extends into the contaminant zone(s). Well placement shall consider site permeability, area and mass of contaminant plume(s) above the applicable RBSLs or applicable SSTLs, and seasonal ground water fluctuations. Provide the calculations that demonstrate the designed total vacuum of the proposed system exceeds the demand of the total required vacuum of all extraction points including friction losses, vacuum losses, etc.
- d. If SVE is the proposed CAT, then provide a monitoring plan to verify that the system is effectively creating vacuum within the contaminant plume(s). Vacuum verification monitoring wells shall be installed such that the screen is always above the water

table and extends into the contaminant zone(s). Well placement shall consider site permeability, area and mass of contaminant plume(s) above the applicable RBSLs or SSTLs, and seasonal ground water fluctuations.

- e. Provide a scaled plan view map depicting the area affected by the remediation. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, vacuum verification monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.
- f. If applicable, then provide a scaled plan view map depicting the calculated effective radius of influence of the proposed CAS overlaid on maps of the horizontal and vertical contaminant plumes for any available analytical data for the COCs.
- g. Provide a sampling plan describing the field screening and sampling that will be conducted in accordance with the current EAG to verify COC concentration reduction is occurring in accordance with this CAP. The plan shall include the number and locations of the samples to be collected. Provide a scaled site map depicting the sampling points. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.
- h. If applicable, then provide a detailed description of any self-initiated soil cleanup measures not previously approved by the division. Describe how this will affect the proposed CAT.

3. Monitored Natural Attenuation

- a. If Monitored Natural Attenuation (MNA) is a chosen method of soil remediation, then provide a description of the proposed CAT. **MNA cannot be a stand-alone method of remediation.** Specify why this proposed CAT is best suited for implementation at this site. Include as justification a discussion of costs and overall project life expectancy. Provide a detailed description including:
 - i. Estimated volume of soil to be remediated;
 - ii. Biological and/or geochemical parameters to be sampled;
 - iii. Implementation schedule; and

- iv. A plan for monitoring the progress of the contaminant degradation process.
- b. Provide a scaled site map depicting the area to be remediated by natural attenuation. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.
- c. Provide a scaled site map depicting the natural attenuation zone overlaid on maps of the horizontal and vertical contaminant plume(s) for any available analytical data for the COCs.
- d. Provide a sampling plan describing the type and frequency of sampling that will be conducted to verify the in-situ concentrations of the COCs after attenuation. The plan shall include the number and locations of the samples to be collected. Provide a scaled site map depicting the sampling points. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.

B. Ground Water

If ground water contamination above the applicable RBSLs or the SSTLs exists on site, then state the proposed extraction method and/or proposed treatment CAT that will most expeditiously and cost effectively reduce concentrations to the applicable RBSLs or SSTLs. A telemetry system shall be proposed on all active ground water CAS sites as described in subparagraph c. below. **The ground water recovery method of choice shall be vacuum enhanced ground water extraction unless another method of extraction is approved by the division.** If vacuum enhanced ground water extraction is not feasible at this site, then provide a justification for the proposed alternative ground water treatment method. The following outline shall be used in evaluating the applicability of this proposed CAT to the site.

1. Ground Water Extraction

- a. A vacuum enhanced ground water extraction shall be the preferred CAT for ground water extraction. All recovery wells shall be a minimum of four inches in diameter unless otherwise approved by the division. All extraction wells shall be properly sealed to maintain the designed vacuum. Provide a detailed description including:
 - i. Individual component specifications;

- ii. Capital costs (Prepackaged systems should not be broken into individual components);
 - iii. Total system installation costs;
 - iv. Recovery well/trench, number, placement and design;
 - v. Effective radius of influence;
 - vi. Trench and piping design;
 - vii. Treatment and/or disposal of soil cuttings and/or excavated material that will be screened and sampled in accordance with the current TGD – 005 and/or TGD - 009;
 - viii. Extraction rates (gallons per minute);
 - ix. Iron sequestering process;
 - x. Winterization considerations;
 - xi. Facility down time (loss of business);
 - xii. Implementation schedule, and
 - xiii. Any other pertinent information.
- b. Provide a process flow diagram including all components of the extraction system. Provide all equipment brochures and manufacturers' design specifications in Appendix B.
 - c. Provide a description of the telemetry system to be used including critical components of the CAS that must be monitored in order to prevent damage to the system or system shutdown and all programmed alarm codes and settings.
 - d. Provide a scaled plan view map depicting the layout of the extraction system. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.
 - e. Provide a scaled plan view map with a flow net diagram depicting the calculated effective radius of influence of the extraction system overlaid on maps of the horizontal and vertical contaminant plumes for any available analytical data for the COCs. Provide the calculations that demonstrate the total vacuum of the proposed system exceeds the demand of the total required vacuum of all extraction points including friction losses, vacuum losses, etc.
 - f. If applicable, then provide a detailed description of any self-initiated ground water cleanup measures not previously approved by the division. Describe how this will affect the proposed extraction system. If any self-initiated ground water cleanup measures are currently in operation (e.g., free product removal, etc.), then explain how the implementation of the

extraction system will enhance or alter the current system. If the system is currently in operation, then show the actual measured radius of influence.

2. Ground Water Treatment

- a. Provide a detailed description of the proposed CAT. An oil/water separator shall be proposed as part of the installation prior to the treatment system, unless justification is provided that it may not be necessary for free product removal. Specify why this proposed CAT is best suited for implementation at this site. Include as justification a discussion of costs and overall project life expectancy. Provide a detailed description including:
 - i. Individual component specifications;
 - ii. Capital costs (Prepackaged systems should not be broken into individual components);
 - iii. Total system installation costs;
 - iv. Treatment and disposal of free product and/or ground water;
 - v. Pumping rates (gallons per minute);
 - vi. Iron sequestering process;
 - vii. Winterization considerations;
 - viii. Effluent discharge options and costs;
 - ix. Facility down time (loss of business);
 - x. Implementation schedule; and
 - xi. Any other pertinent information.
- b. Provide a diagram (process flow and instrumentation) including all components of the treatment system (i.e.- sampling ports, gauges, switches, valves, etc.). Provide all equipment brochures and manufacturers' design specifications in Appendix B.
- c. Provide a detailed description of any self-initiated ground water cleanup measures that are currently in operation (e.g., free product removal, etc.), then explain how the implementation of the treatment system will enhance or alter the current system.
- d. Provide a sampling plan describing the sampling that will be conducted in accordance with the current EAG to verify COC concentration reduction is occurring in accordance with this CAP. The plan shall include the number and locations of the samples to be collected including influent and effluent of the CAS.

- e. Provide a detailed discussion of the ground water disposal method(s). Specify why this method(s) is (are) best suited for this site including the life expectancy of the project.
3. Monitored Natural Attenuation
- a. If MNA is a chosen method of ground water remediation, then provide a detailed description of the proposed CAT. **MNA cannot be a stand-alone method of remediation.** Specify why this proposed CAT is best suited for implementation at this site. Include as justification a discussion of costs and overall project life expectancy. Provide a detailed description including:
 - i. Biological and/or geochemical parameters to be sampled;
 - ii. Implementation schedule; and
 - iii. A plan for monitoring the progress of the contaminant degradation process.
 - b. Provide a scaled plan view map depicting the area to be remediated by natural attenuation. Include existing and/or former tank, line and dispenser locations, underground utilities, soil borings and monitoring wells, etc. and if applicable, the proposed excavation depth(s). Indicate former tank systems with a dashed line.
 - c. Provide a scaled plan view map depicting the natural attenuation zone overlaid on maps of the horizontal and vertical contaminant plume(s) for any available analytical data for the COCs.
 - d. Provide a sampling plan describing the sampling that will be conducted in accordance with the current EAG to verify COC concentration reduction is occurring in accordance with this CAP. The plan shall include the number and locations of the samples to be collected.

IV. Cost Proposal

Complete the attached Corrective Action Cost Proposal and provide a detailed breakdown of the proposed costs for each proposed CAT. All cost proposals and vendor bids shall represent current market prices.

V. Sampling and Reporting

All new impacts identified during sampling shall require written 72 hour notification to the division. All measurements and samples shall be collected while the CAS is in operation.

A. Soil

A list of all applicable COCs that will be analyzed in accordance with the sampling plan shall be provided in Section III A.1.d or A.2.g or A.3.d of Part B of this CAP.

B. Ground Water

A list of all applicable COCs that will be analyzed in accordance with the sampling plan shall be provided in Section III B.2.d or B.3.d of Part B of this CAP.

C. Drinking Water Sources

Provide a sampling plan describing the type and frequency of sampling to be conducted of all drinking water receptors identified during the assessment activities, and a list of all COCs that will be analyzed. The plan shall include the number and locations of the samples to be collected. These locations shall be depicted on a color topographic map.

D. Surface Water

Provide a sampling plan describing the type and frequency of sampling to be conducted of surface water locations identified during the assessment activities, and list of COCs that will be analyzed. The plan shall include the number and locations of the samples to be collected.

E. Vapor Monitoring

Provide a sampling plan describing the type and frequency of monitoring events to be conducted of any vapor monitoring that will be performed. The plan shall include the number and locations of the samples to be collected. These locations shall be depicted on a map. The type of monitoring instrument, make and model number, and calibration procedure, and frequency to be followed shall be provided.

F. Emissions

Provide a sampling plan describing the type and frequency of sampling to be conducted of any emissions monitoring from the proposed CAS that will be performed, if applicable. The plan shall include the number and locations of the samples to be collected. The type of monitoring instrument, make and model number, and calibration procedure, and frequency to be followed shall be provided.

G. Land and Water Use and Receptor Monitoring

Provide a plan describing the type and frequency of monitoring to be conducted of all changes in land, surface water, and ground water use, and current receptors surrounding the site as determined in the EA. [The discovery, addition, or removal of receptors may change the basis upon which the applicable RBSLs or SSTLs were developed. If a change that would affect the applicable RBSLs or SSTLs is noted, then the PAR for CAP implementation will immediately notify the division and a meeting may be requested.]

H. Corrective Action System Evaluation

If a CAS is proposed, then provide a plan to determine the effectiveness of the proposed CAS. The plan shall include, at a minimum:

1. A discussion of the evaluations and goals established in the proposed CAP;
2. System runtime (% uptime);
3. System operation versus manufacturers' specifications;
4. Venting system efficiency (%), if applicable;
5. Vacuum system efficiency (%), if applicable;
6. Air stripper efficiency (%), if applicable;
7. Contaminant removal efficiency (%);
 - a. Free product recovery [current thickness versus thickness at the time of installation (%) and product distribution], if applicable;
 - b. Ground water concentration reduction [historical concentration versus time (ppm/year) and current concentration versus concentration at the time of installation (% reduction)], if applicable;
 - c. Soil concentration reduction [historical concentration versus time (ppm/year) and current concentration versus concentration at the time of installation (% reduction)]; if applicable;
8. Equipment expendables (i.e. filters, belts, oil, etc.) versus time; and
9. Corrective Action Technology (CAT) specific indicators of performance, including but not limited to: pH fluctuation, oxygen depletion, biological and/or geochemical parameters indicative of a need for modification of the CAT.

VI. Operation and Maintenance

Provide a detailed discussion of the planned O&M requirements of the proposed CAS. Costs for performing these activities shall be included in accordance with the Corrective Action Cost Proposal in an appendix using the log and table formats found in Appendix C.

A. Startup Activities and Schedule

Provide a description and schedule of startup system O&M for the proposed CAS. Provide a description of the startup activities that differ from routine system O&M, including system monitoring and adjustment activities and why they are required. The description shall include the number and type of personnel and equipment that are required to perform the startup activities.

B. Routine System O&M and Schedule

Provide a description and schedule of routine system O&M for the proposed CAS. Routine O&M shall be defined as:

1. Scheduled site visits as required to inspect and document system performance, perform routine repairs or scheduled repairs;
2. Inspect for leaks, excessive equipment heat and noise, and/or equipment wear;
3. Check recovery well pumps and components, change out filters, hoses, compressor oil, pressure steam stripper, backwash system to remove fouling and iron buildup, repair/replacement of gauges, lubricants, and belts.

The description shall include the number and type of personnel and equipment required to perform routine system O&M. The description shall not include major repairs or extensive trouble-shooting, which may be covered by the manufacturer. If site visits are scheduled for more than once per month, then provide justification for additional visits.

C. Contingencies

Provide a contingency plan for potential unscheduled O&M activities, including at a minimum:

- (1) Equipment repairs;
- (2) Excursions from the proposed CAS (Excursions may include flooding of the system, frozen/broken pipes, permit violations, etc.);
- (3) System noise nuisance(s),
- (4) Extended period of system down time; and
- (5) Telemetry notification of system problem.

VII. Performance Measures, Triggers, and Contingencies

Provide a list of PMs that, if accepted by the Division, will be used to gauge the effectiveness of the proposed CAT and make determinations as to when modifications to and/or termination of the CAP would be appropriate. In describing the PM, be sure to specify the type of data to be gathered, the frequency or schedule for gathering data, and set a predicted trend line for comparison over time. Some PMs may deal with land or ground water use

instead of physical measurements. In these cases, propose a method and frequency for evaluating changes that may affect the basis upon which the applicable RBSLs or SSTLs were set. For example, if a new building with a basement is built immediately adjacent to the site, then the risk shall be re-evaluated to determine if the applicable RBSLs or SSTLs should be changed.

In addition to setting PMs, propose triggers and contingency actions that would occur if the proposed CAT did not perform as predicted. The following are examples of how PMs with a trigger and a contingency should be constructed:

PM 1 - Benzene concentrations in each (or specify) ground water monitoring well will decline (x%) in 24 months. If the percent reduction is (x%) less than predicted, then the division shall be notified via the site status monitoring report. A meeting may be requested at which time modifications to the system and/or the CAP will be proposed to address the less than predicted reduction in contaminant concentration.

PM 2 - The system runtime shall be x%. If the percent of time the system has actually operated is less than x%, then the division shall be notified via the site status monitoring report. A meeting may be requested to discuss the problems with the system that are adversely affecting runtime.

PM 3 - The efficiency of the air stripper shall be x%. If the efficiency is less than x%, then the division shall be notified via the site status monitoring report. A meeting may be requested at which time modifications to the system and/or the CAP may be discussed and possibly proposed to address system efficiency.

VIII. Additional Information

Provide any additional information that may be pertinent to the corrective action not previously requested. If applicable, provide the information in tables or maps.

IX. Signature Page

Provide a signature page as attached

X. Appendices

Provide information as required in Part A and Part B of the CAP using the log and table formats found in Appendices A – C.

A. Log and Table Formats To Be Used For this CAP

B. Equipment Brochures and Manufacturers' Design Specifications

C. Corrective Action Cost Proposal

Signature Page

A signature page, as shown below shall be attached to the CAP. The page shall be signed by the owner/operator (or authorized representative within the organization) and a registered professional geologist under the Tennessee Geologist Act (*T.C.A. §62-36-101 et seq.*), or a registered professional engineer under the Tennessee Architects, Engineers, Landscape Architects, and Interior Designers Law and Rules (*T.C.A. §62-2-101 et seq.*).

We, the undersigned, certify under penalty of law, including but not limited to penalties for perjury, that the information contained in this report form and on any attachments, is true, accurate and complete to the best of our knowledge, information, and belief. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for intentional violations.

Owner/Operator (Print name)

Signature

Date

Title (Print)

P.E. or P.G. (Print name)

Signature

Date

Stamp/seal

Tennessee Registration #

Note: Each of the above signatures shall be notarized separately with the following statement.

STATE OF _____

COUNTY OF _____

Sworn to and subscribed before me by _____ on this date

_____. My commission expires _____.

Notary Public (Print name)

Signature

Date

Stamp/Seal